

1 **DAMPER CONTROL DEVICE FOR OUTSIDE APPLICATIONS**
2 (109044.00006)
3

4 **RELATED APPLICATION**

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6 This application claims priority benefit of U.S. provisional patent application
7 No. 60/431,564 filed on December 6, 2002.

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9 **FIELD OF THE INVENTION**

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11 This invention relates to a device for electronically controlling a damper in a
12 flue, and more particularly to chimney mounted dampers.

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14 **BACKGROUND OF THE INVENTION**

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16 Many homes today have fireplaces where a flue in a chimney connects the
17 outside air to the fireplace. Such a connection can result in leakage of cold air into
18 the home. A damper was used in some instances to keep the cold air out. That is,
19 in some instances a damper was positioned in the flue and was movable between a
20 closed position which prevented air from leaking into or out of the home and an open
21 position which allowed air to flow and exhaust products of combustion to flow out of
22 the home. Such known dampers were controlled by a chain, handle, lever or the like
23 and an operator had to remember to open the damper prior to starting a fire in the
24 fireplace, or else the products of combustion would become trapped in the home.

1 The products of wood fireplaces can include soot and smoke. Soot and
2 smoke are visible, and if a wood fireplace had a damper which was closed, it would
3 become immediately apparent that the damper was closed upon combustion of the
4 wood. However, the products of incomplete gas combustion can be invisible and
5 toxic (CO₂, CO, for example). Because of this potentially hazardous situation,
6 ventilation of air has been required for gas fireplaces where dampers have been
7 used. That is, the damper had to be permanently blocked open. Further, in many
8 places dampers were not allowed to be used in combination with gas fireplaces. It
9 would be highly desirable to have a damper positioned in a fireplace, particularly a
10 gas fireplace, so as to prevent air from entering or exiting a home and which is also
11 safe and reliable.

12

13 **SUMMARY OF THE INVENTION**

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15 In accordance with a first aspect, a damper control device suitable for use in a
16 fireplace comprises a flue, wherein products of combustion from the fireplace enter
17 the flue, a damper positioned in a damper pipe which is connected to the flue, with
18 the damper movable between open and closed positions, a motor having a shaft
19 connected to the damper, and a control circuit which initiates combustion and which
20 receives a damper signal which indicates whether the damper is in the open or
21 closed position. When a fire is desired, the control circuit initiates combustion after
22 receiving the damper signal indicating that the damper is in the open position. In
23 accordance with another aspect, the damper control device may be provided with a

1 mounting ring extending generally perpendicularly from the damper pipe,
2 connecting the damper pipe to the flue. In accordance with another aspect, an
3 adapter can be added to allow passage of air along the flue when an air cooled flue
4 is used.

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6 From the foregoing disclosure and the following more detailed description of
7 various preferred embodiments it will be apparent to those skilled in the art that the
8 present invention provides a significant advance in the technology and art of damper
9 control devices. Particularly significant in this regard is the potential the invention
10 affords for providing a high quality damper control device for fireplaces and other
11 outside applications with increased energy efficiency. Additional features and
12 advantages of various preferred embodiments will be better understood in view of
13 the detailed description provided below.

14

15 BRIEF DESCRIPTION OF THE DRAWINGS

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17 Fig. 1 is a perspective schematic view illustrating a chimney incorporating a
18 damper control device in accordance with a preferred embodiment.

19 Fig. 2 is a simplified schematic of a control circuit for a damper control device
20 in accordance with a preferred embodiment.

21 Fig. 3 shows an optional status module indicating the status of various
22 elements of the damper control device.

1 Fig. 4 is a perspective view of a damper, its housing and a damper pipe to
2 connect with a flue.

3 Fig. 5 is a perspective view of an adapter suitable for use with the damper
4 pipe when the damper is to be installed in an air-cooled flue.

5 Fig. 6 is a schematic view of the adapter connected to an air cooled flue.

6

7 It should be understood that the appended drawings are not necessarily to
8 scale, presenting a somewhat simplified representation of various preferred features
9 illustrative of the basic principles of the invention. The specific design features of
10 the damper control device as disclosed here will be determined in part by the
11 particular intended application and use environment. Certain features of the
12 illustrated embodiments have been enlarged or distorted relative to others to
13 facilitate visualization and clear understanding. In particular, thin features may be
14 thickened, for example, for clarity of illustration. All references to direction and
15 position, unless otherwise indicated, refer to the orientation illustrated in the
16 drawings.

17

18 DETAILED DESCRIPTION OF CERTAIN PREFERRED EMBODIMENTS

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20 It will be apparent to those skilled in the art, that is, to those who have
21 knowledge or experience in this area of technology, that many uses and design
22 variations are possible for the damper control device disclosed here. The following
23 detailed discussion of various alternative and preferred features and embodiments

1 will illustrate the general principles of the invention with reference to a damper
2 control device for a gas fireplace. Other embodiments suitable for other
3 applications, such as wood burning fireplaces, will be apparent to those skilled in the
4 art given the benefit of this disclosure.

5

6 Turning now to the drawings, Fig. 1 shows a chimney 10 having a fireplace
7 12, a flue 14 which receives products of combustion from the fireplace, and a
8 damper 20. In the preferred embodiment shown here, the fireplace is a gas
9 fireplace, with the gas supplied by a gas line 29. The damper 20 is movable
10 between a closed position where it prevents outside air from flowing down into the
11 flue and from there leaking into a house, to an open position (as shown in Fig. 1)
12 where the products of combustion can escape to the outside. The damper has
13 wiring 22 connecting to a power source and optionally connecting to a status module
14 16 (which can be remote from the fireplace 12). An on/off switch 24 may be
15 provided to control power to a damper motor 44 (shown in Fig. 1), to control power
16 to send a fireplace signal to open a gas valve 28 in a gas line. It will be readily
17 apparent to those skilled in the art, given the benefit of this disclosure, that the on/off
18 switch could be incorporated into a handheld wireless or remote device and that
19 such a remote device can be used when a fire is desired at the fireplace.

20

21 A schematic of a control circuit 40 showing wiring 22 connecting the damper
22 20 to the gas valves 28 is shown in Fig. 2. The power source shown would be a
23 conventional home power source, 120V AC current. The control circuit can

1 comprise a printed circuit board with limit switches (not shown). The motor 44
2 rotates the output shaft 34 and damper 20 (shown best in Fig. 4). The limit switches
3 would be connected to a cam (not shown) that is slaved with the damper 20 to
4 engage the switches as the damper moves between the open and closed positions.
5 The status module may optionally be provided with a printed circuit board with built-
6 in time-delay for returning the damper to the closed position at a predetermined time
7 after the fireplace fire is extinguished.

8

9 When the fireplace is put in use, an electric signal from a control (e.g.,
10 manual switch 24, etc.) generates the fireplace signal to open the gas valve. Prior to
11 this, however, the damper 20 is sent a call to move to the open position. Through
12 the use of the limit switches, the damper sends a damper signal indicating whether
13 the damper is in the open position or closed position. In accordance with a highly
14 advantageous feature, only when the damper has moved to the open position will
15 combustion be initiated.

16

17 As shown in Fig. 3, optionally a status module 16 may be provided,
18 electronically connected to the damper 20 and to the fireplace gas valves and igniter
19 31. This module would consist of lights indicating the status of the damper for either
20 operational or troubleshooting purposes. In the preferred embodiment shown in Fig.
21 3, indicator lights would respond to a signal indicating several different conditions.
22 These conditions can comprise, for example, whether the overall system has power,
23 whether the damper is open (as indicated by a damper signal), and whether the

1 fireplace signal has been sent, etc. The status module may also optionally be
2 provided with a service switch 99 to hold the damper in the open position in the
3 event of intermittent operation, allowing the fireplace to be used while waiting for
4 service.

5

6 Moreover, the status module 16 optionally may indicate at 100 whether a
7 second damper is open, in those preferred embodiments where a second damper is
8 used. Such applications can comprise, for example, designs where air used in
9 combustion of gas is drawn from the outside. As a further option, the status module
10 may also be connected to the control circuit so as to indicate a response from a
11 sensor signal from a sensor which senses a pollutant such as, for example, carbon
12 dioxide or carbon monoxide levels, or heat in the house. A sensor as described
13 here could be particularly useful with wood burning applications. When such
14 pollutant reaches a predetermined criteria the control circuit would send a signal to
15 move the damper 20 to the open position and to indicate this at 101 on the status
16 module . Such an indication or alarm can be a light or an audible sound, for
17 example. In some preferred embodiments neither the combustion air unit 100 or
18 pollutant sensor 101 is used. In such circumstances neither indicator would be
19 necessary on the status module. Other combinations of features will be readily
20 apparent to those skilled in the art given the benefit of this disclosure.

21

22 Turning now to the damper 20 installation in the flue 14, Fig. 4 shows the
23 damper 20 positioned in a damper pipe 32, drive motor and accompanying

1 electronic controls 44 positioned in a preferably weatherproof damper control box
2 18. Preferably the drive motor and electronic controls are electrically connected to
3 the control circuit via wiring 22 (shown in Fig. 1). To rotate the damper between
4 open and closed positions, a rotatable shaft 34 operatively connects the drive motor
5 and the damper. As the flue can get quite hot during operation of the fireplace, the
6 rotatable shaft serves to space the drive motor and electronic controls away from the
7 flue and damper pipe 32. Also, shaft 34 is preferably at least partially enclosed by
8 shroud 30 to protect the shaft from weathering, dirt, etc. The shroud may optionally
9 be provided with ventilation 51.

10

11 In the preferred embodiment shown in Fig. 4, a portion 37 of the damper pipe
12 32 may extend beyond a mounting member 36, shown here as a ring-like structure.
13 The portion 37 is adapted to fit inside the flue 14, and mounting brackets 38 are
14 adapted to receive bolts that would fit into the chimney, thereby securing the damper
15 20 and damper pipe 32 to the chimney.

16

17 Figs. 5-6 are associated with another preferred embodiment where an air
18 cooled flue is used. In an air cooled flue, an outer sleeve 115 is spaced apart from
19 the flue 114, permitting air to flow past the flue and transfer heat. So that the
20 damper does not block this flow of air, an adapter 42 is provided. The adapter 42
21 has an interior pipe 47, an exterior pipe 48, and spacers 54 connecting the interior
22 pipe and exterior pipe so as to permit air to pass through a first air passageway
23 around the adapter and reach the flue. The exterior pipe may be provided with a

1 series of openings 77 forming a second air passageway. As shown in the schematic
2 view of Fig. 6, preferably the inner pipe 47 fits snugly inside the flue 114, and the
3 external pipe 48 fits snugly against the outer sleeve 115. Other connections
4 between the adapter and the flue will be readily apparent to those skilled in the art
5 given the benefit of this disclosure.

6

7 The flue 14, damper pipe 32, and adapter pipes 47, 48 as well as the shroud
8 30 and damper control box 18 may optionally be constructed from sheet metal. The
9 chimney 10 may be made of bricks. In such embodiments, the flue may also be
10 formed as a separate tube or merely as a passageway in the bricks.

11

12 From the foregoing disclosure and detailed description of certain preferred
13 embodiments, it will be apparent that various modifications, additions and other
14 alternative embodiments are possible without departing from the true scope and
15 spirit of the invention. The embodiments discussed were chosen and described to
16 provide the best illustration of the principles of the invention and its practical
17 application to thereby enable one of ordinary skill in the art to use the invention in
18 various embodiments and with various modifications as are suited to the particular
19 use contemplated. All such modifications and variations are within the scope of the
20 invention as determined by the appended claims when interpreted in accordance
21 with the breadth to which they are fairly, legally, and equitably entitled.